Appendix 5-A (Cost Chapter)
Cost Analysis Methodology

I. INTRODUCTION

The methodology will be employed to estimate the cost of using three inks: solvent-based, water-based, and UV-cured. The cost research will focus on identifying those cost elements that are different for the three ink processes. It will not only identify traditional costs, but also costs that are typically "hidden" in printing operations.

The primary source for the cost information will be the performance demonstrations. These costs will be gathered at the printing sites. (Sample data collection sheets are provided in Appendices 4-B and 4-C.) This information will be supplemented with information from industry statistics, supplier information, and other sources. The cost estimation is intended to reflect standard industry practices and provide representative data for the given ink process.

Besides determining and categorizing the costs incurred while using the three inks, the less tangible benefits or costs that can result from the implementation of each ink will be identified in a qualitative manner with annual or quarterly costs as supporting documentation (if available).

In order to normalize the cost data for comparative purposes, two standards were chosen: 6,000 images and 6,000 square feet of image.

The final cost estimates for each ink system will consist of four major cost elements: materials, labor, capital, and energy use.

II. MATERIAL COSTS

Material costs will consist of those costs that differ between the three ink types (ink and additives). The performance demonstrations will be the main avenue for retrieval of these costs, but suppliers and industry experts will also be consulted. Costs associated with special storage requirements of the inks, such as additional fire protection, ventilation, or regulatory requirements will not be considered quantitatively in the cost analysis. For example, solvent-based ink storage requires a local fire inspection, registration, and storage room ventilation, whereas water-based and UV-cured may not require the same precautions. These cost differentials will be difficult to quantify in the performance demonstrations and hard to acquire from industry.

The main components of the material costs will be ink and additives. For these costs, the quantity used will be gathered during the performance demonstrations and multiplied by an industry average cost, gathered from manufacturers and industry reports. The cost differences associated with cleaning for each ink type, if substantial, will be discussed in a qualitative fashion.

1. Ink costs:
   a) Manufacturer's price for all three inks and for four or five colors/three substrates (based on a given volume purchased [110-500 lb allotment])
   b) Amount of ink used to come up with a similar appearance for all three inks during start-up and run-time
2. Diluent or reducer (usage and price); price will be based on a given volume purchased

For ink and additives, prices will be collected and presented to the project design subcommittee for review and confirmation. The following items will be dealt with in a qualitative manner if the differences among the ink processes are substantial.

- Doctor blades
- Plates
- Bulbs for drying lamps
- Clean-up procedures and industry recommendations

III. LABOR COSTS

Labor costs will include the time spent on press (start-up, run-time, and clean-up), the hourly wage rate for a press person and assistant, fringe costs per person, and overhead expenses per person. Because wage rates vary throughout the country and are dependent on union versus non-union shops, wage rates from the performance demonstration and from industry reports will be used to determine a fixed rate. This cost will then be multiplied by a fringe and overhead rate (from industry studies) to establish a reasonably inclusive cost of labor.

IV. CAPITAL COSTS

Equipment costs for the inks will be considered, but equipment costs common to all inks will be excluded from analysis. The capital costs will be amortized, and an average rate of return on capital will be used. Costs scenarios will be developed for both new equipment purchases and for retrofitting existing presses.

The equipment costs will take into account the costs of purchasing both new equipment and retrofitting existing equipment. The equipment costs will be gathered from manufacturer's prices and industry averages. A yearly equipment cost will be determined, which then will be divided by total production hours per year to get an hourly equipment rate.

A. Capital Costs for New Equipment

Costs above a baseline for the press equipment will include, when applicable, the following factors for each ink system:

1) Control technologies
2) Process equipment
3) Installation
4) Project engineering

B. Capital Costs for Retrofitting Equipment

Retrofitting costs will be estimated for all the auxiliary equipment. Retrofitting costs will reflect an average retrofit package that will identify the relevant equipment for four retrofits:

1. Solvent-based to water-based press:
   a) Dryer capacity enhancement: using enlarged exhaust and supply fans
   b) Additional ductwork and noise abatement equipment (possible)
   c) Ink handling equipment upgrade (ink metering rolls were replaced to facilitate drying; pumps may need to be replaced; press roller modification)
   d) Install an in-line corona treatment system
2. Solvent-based to UV-cured press:
   a) Remove inter-deck dryers
   b) Shut-off gas
   c) Turn off air blowers

d) Install interdeck UV lamps
e) Install chiller
f) Install blowers for lamps
g) Miscellaneous: may also require chambered doctor blades, peristaltic pumps, a corona treater, and web scrubber. These may be present on a newer solvent-based press.

3. Water-based to UV-cured press
4. UV-cured to water-based press

C. Depreciation Rate

The depreciation rate will be based on that used for standard industry accounting practices.

D. Depreciation Period

The depreciation period, or average lifetime of a press, can vary substantially depending on whether the equipment is upgraded or a retrofit is performed. The depreciation period for this calculation will be based on estimates of the lifetime of a press with no modifications or upgrades other than routine maintenance.

V. ENERGY COSTS

The energy usage differences associated with the three inks will be quantified, including that resulting from the use of dryers, corona treaters, exhaust air blowers, and the presses on standby.

A. Energy consumption

Energy consumption calculations will include the following considerations:

1. Process equipment (dryers, corona)
2. Exhaust air purification (measure the gas used to operate and then divide by the total # of presses)
3. Temperature conditioning

B. Cost of Electricity and Natural Gas

The average cost of electricity is about .05-.06 per unit, yet this varies considerably depending on the state. For example, in Michigan electricity costs .08 per unit, while in Ohio, electricity costs .30 per unit. Natural gas prices experience similar ranges. This type of variation will be noted in the cost analysis, and readers will be directed to adjust their calculations accordingly.

VI. WASTE TREATMENT AND DISPOSAL COSTS

Differences in the costs associated with safety equipment, waste treatment, insurance, liability, and regulatory compliance for the three ink processes will be dealt with in a qualitative manner. For example, costs associated with on-site treatment or shipping and off-site treatment may be difficult to quantify in the performance demonstrations for the three inks. Yet, there are some clear differences in the amount and type of disposal or treatment associated with solvent, water-based, and UV-cured inks. From the performance demonstrations and from industry reports and articles, these differences will be identified and presented in a qualitative manner.

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Appendix 5-B (Cost Chapter)
Supplemental Cost Analysis Information

This appendix provides details of costs provided in the text of the chapter. Sample calculations are included to more clearly illustrate the equations shown in Section 5.2. Tables showing cost estimates for the individual performance demonstrations also are provided.

SAMPLE CALCULATION FOR INK COSTS

For Site 5, solvent-based ink on LDPE:

Ink price (white)	=	\$1.40 per pound
Ink price (color)	=	\$2.80 per pound
Amount of white ink used	=	26.6 pounds
Amount of colored ink used	=	75.8 pounds
Substrate area covered (white)	=	39,762 ft^2
Substrate area covered (color)	=	74,515 ft^2
Image area	=	2.22 ft^2/image

Ink cost per 6,000 images (white)	=	ink price (\$/lb) × (amount of ink used [lb] / substrate area covered [ft^2]) × 2.22 ft^2/image × 6,000 images
	=	(\$1.40/lb) × (26.6 lbs / 39,762 ft^2) × 2.22 ft^2/image × 6,000 images
	=	\$12.48 per 6,000 images

Ink cost per 6,000 images (color)	=	ink price (\$/lb) × (amount of ink used [lb] / substrate area covered [ft^2]) × 2.22 ft^2/image × 6,000 images
	=	(\$2.80/lb) × (75.8 lbs / 74,515 ft^2) × 2.22 ft^2/image × 6,000 images
	=	\$37.60 per 6,000 images

Ink cost per 6,000 images (total)	=	\$12.47 + \$37.60
	=	\$50.07 per 6,000 images

DETERMINATION OF OVERHEAD RATE

The overhead rate was calculated with data from the National Association of Printers and Lithographers' *NAPL Heatset and Non-Heatset Web Press Operations Cost Study of 1989-1990*, which is presented below, and with information presented in the chapter. The overhead rate is used in labor cost calculations.

Table 5-B.1 Overhead Costs of an Average Printing Facility

Component	Comment	Cost
Rent and heat	$2.50 per square feet; use 1,000 square feet for model facility	$2,500
Fire and sprinkler insurance	$4.00 per $1,000 of equipment investment cost	$2,426
Indirect labor	10% of direct labor ($156,398)	$15,640
Direct supplies		$6,000
Repair to equipment	3% of equipment costs for three shifts	$18,195
Subtotal		**$44,761**
General factory	10% of subtotal	$4,476
Administrative and selling overhead	32% of subtotal	$14,324
Total overhead costs		**$63,561**

Source: NAPL, 1990.

The overhead rate was calculated using the formula shown below. The overhead factor is based on data from the NAPL study, and the derivation of the wage and fringe are presented in the chapter.

Overhead rate = Overhead factor × (wage + fringe)

where

Overhead factor = Total overhead costs / direct labor cost
= $63,561 / $156,398
= 0.41

Overhead rate = Overhead factor × (wage + fringe)
= 0.41 × ($11.49 + $4.14)
= $6.41

SAMPLE CALCULATION FOR LABOR COSTS

For Site 5, solvent-based ink on LDPE:

Labor rate, including overhead = $44.08 per hour (two workers)
Image width = 1.67 feet
Image area = 2.22 ft^2/image
Press speed = 400 feet per minute, 24,000 feet per hour

Labor cost per 6,000 images = labor cost per hour ($/hour) / ft^2 printed per hour × 2.22 ft^2/image × 6,000 images
= ($44.08/hour) / (24,000 feet/hour x 1.67 feet) × 2.22 ft^2/image × 6,000 images
= $14.69 per 6,000 images

Labor cost per 6,000 ft^2 of image = labor cost per ft^2 ($/$ft^2$) × 6,000 ft^2
= ($44.08/hr) / (24,000 feet/hour x 1.67 feet) × 6,000 ft^2
= $6.61 per 6,000 ft^2 of image

SAMPLE CALCULATION FOR CAPITAL COSTS

For Site 5, solvent-based ink on LDPE,

Average press speed (solvent-based inks) = 400 feet per minute

Annual capital cost ($/yr) = $$A = T * \frac{i(1+i)^n}{(1+i)^n - 1}$$

T = total cost (price of press) = $2,600,000
i = interest or depreciation rate = 15%
n = lifetime of equipment = 20 years

A = annual capital cost = $415,000

The hourly capital cost estimates were based on the following calculation:

Capital cost per 6,000 images = C × 2.22 ft^2/image × 6,000 images
Capital cost per 6,000 ft^2 of image = C × 6,000 ft^2

where

C = capital cost per ft^2 ($/$ft^2$)
= hourly capital cost ($/hr) × repeat length per ft^2 of image (ft/ft^2) / average press speed (ft/hr)

and

Annual operating hours = 4,200 hours per year

Hourly capital cost ($/hr) = A ($/yr) / annual operating hours (hr/yr)
= $415,000 per year / 4,200 hours per year
= $99 per hour

C = $99 per hour × (1.33 ft / 2.22 ft^2) / (400 ft/min × 60 min/hr)
= $0.0025 per ft^2

Capital cost per 6,000 images = C × 2.22 ft^2/image × 6,000 images
= $0.0025 per ft^2 × 2.22 ft^2/image × 6,000 images
= $33 per 6,000 images

Capital cost per 6,000 ft^2 of image = C × 6,000 ft^2
= $0.0025 per ft^2 × 6,000 ft^2
= $15 per 6,000 ft^2 of image

SAMPLE CALCULATION FOR ENERGY COSTS

For Site 5, solvent-based ink on LDPE,

Electricity consumption	=	55 kW
Natural gas consumption	=	650,000 Btu per hour
Electricity cost	=	$0.0448 per kWh
Natural gas cost	=	$3.05 per million Btu
Image area	=	2.22 ft^2/image
Press speed	=	400 feet per minute

E = electricity cost ($/kWh) x [electricity consumption (kWh/hour) / press speed (ft/hour)] x repeat length per ft^2 of image (ft/ft^2)
= electricity cost per ft^2 ($/$ft^2$)
= $0.000062 per ft^2

G = natural gas cost ($/Btu) x [natural gas consumption (Btu/hour) / press speed (ft/hour)] x repeat length per ft^2 of image (ft/ft^2)
= natural gas cost per ft^2 ($/$ft^2$)
= $0.000050 per ft^2

Energy cost per 6,000 images = (E + G) x 2.22 ft^2/image x 6,000 images
= ($0.000062 + $0.000050) x 2.22 ft^2/image x 6,000 images
= $1.48 per 6,000 images

Energy cost per 6,000 ft^2 of image = (E + G) x 6,000 ft^2
= $0.67 per 6,000 ft^2 of image

COST ESTIMATES FOR PERFORMANCE DEMONSTRATION SITES

Tables 5-B.1 through 5-B.13 present the calculated labor, material, capital, and energy costs for each performance demonstration site. Tables 5-B.14 and 5-B.15 present the ink costs and additive costs, respectively, for each site. Table 5-B.16 presents the labor costs for each site.

Table 5-B.2 Cost Summary for Water-based Ink at Site 1*

Cost Category		Cost per 6,000 images for OPP	Cost per 6,000 Sq. Feet for OPP
Labor		$13.67	$6.15
Materials	ink (white)	$11.49	$5.17
	ink (other colors)	$9.69	$4.35
	ink additives	$0.44	$0.22
Capital		$29.46	$13.27
Energy		$0.91	$0.41
Total		**$65.65**	**$29.56**

*Water-based ink #2; 55-inch press at 430 feet per minute

Table 5-B.3 Cost Summary for Water-based Ink at Site 2*

Cost Category		Cost per 6,000 images for LDPE	Cost per 6,000 images for PE/EVA	Cost per 6,000 sq. feet for LDPE	Cost per 6,000 sq. feet for PE/EVA
Labor		$14.59	$14.59	$6.56	$6.56
Materials	ink (white)	$8.61	$0.00	$3.87	$0.00
	ink (other colors)	$16.80	$16.80	$7.53	$7.53
	ink additives	$0.22	$0.12	$0.10	$0.05
Capital		$31.43	$31.83	$14.16	$14.16
Energy		$0.97	$0.97	$0.44	$0.44
Total		**$72.62**	**$63.91**	**$32.66**	**$28.74**

*Water-based ink #3; 54-inch press at 403 feet per minute

Table 5-B.4 Cost Summary for Water-based Ink at Site 3*

Cost Category		Cost per 6,000 images for LDPE	Cost per 6,000 images for PE/EVA	Cost per 6,000 sq. feet for LDPE	Cost per 6,000 sq. feet for PE/EVA
Labor		$26.96	$13.67	$12.13	$6.15
Materials	ink (white)	$12.27	$0.00	$5.52	$0.00
	ink (other colors)	$8.76	$8.76	$3.90	$3.90
	ink additives	$1.51	$0.34	$0.67	$0.16
Capital		$58.10	$29.46	$26.17	$13.27
Energy		$1.79	$0.91	$0.81	$0.41
Total		**$109.40**	**$53.14**	**$49.21**	**$23.89**

*Water-based ink #3; 50-inch press at 218 feet per minute (LDPE) and 430 feet per minute (PE/EVA)

Table 5-B.5 Cost Summary for Water-based Ink at Site 4*

Cost Category		Cost per 6,000 images for OPP	Cost per 6,000 sq. feet for OPP
Labor		$13.06	$5.88
Materials	ink (white)	$12.58	$5.66
	ink (other colors)	$15.69	$7.05
	ink additives	$0.60	$0.28
Capital		$28.15	$12.68
Energy		$0.87	$0.39
Total		**$70.95**	**$31.94**

*Water-based ink #1; 46-inch press at 450 feet per minute

Table 5-B.6 Cost Summary for Solvent-based Ink at Site 5*

Cost Category		Cost per 6,000 images for LDPE	Cost per 6,000 images for PE/EVA	Cost per 6,000 sq. feet for LDPE	Cost per 6,000 sq. feet for PE/EVA
Labor		$14.69	$14.69	$6.61	$6.61
Materials	ink (white)	$12.52	$0.00	$5.63	$0.00
	ink (other colors)	$37.94	$37.94	$17.08	$17.08
	ink additives	$2.73	$1.79	$1.23	$0.81
Capital		$32.93	$32.93	$14.83	$14.83
Energy		$1.48	$1.48	$0.67	$0.67
Total		**$102.29**	**$88.84**	**$46.05**	**$40.00**

*Solvent-based ink #2; 24.5-inch press at 400 feet per minute

Table 5-B.7 Cost Summary for UV-cured Ink at Site 6*

Cost Category		Cost per 6,000 images for LDPE	Cost per 6,000 images for PE/EVA	Cost per 6,000 sq. feet for LDPE	Cost per 6,000 sq. feet for PE/EVA
Labor		$17.09	$16.60	$7.69	$7.47
Materials	ink (white)	$27.12	$0.00	$12.18	$0.00
	ink (other colors)	$25.60	$25.60	$11.50	$11.50
	ink additives	$0.00	$0.00	$0.00	$0.00
Capital		$38.29	$37.21	$17.25	$16.76
Energy		$3.33	$3.23	$1.50	$1.46
Total		**$111.42**	**$82.65**	**$50.12**	**$37.19**

*UV-cured ink #2; 32-inch press at 344 feet per minute (LDPE) and 354 feet per minute (PE/EVA)

Table 5-B.8 Cost Summary for Solvent-based Ink at Site 7*

Cost Category		Cost per 6,000 images for LDPE	Cost per 6,000 images for PE/EVA	Cost per 6,000 sq. feet for LDPE	Cost per 6,000 sq. feet for PE/EVA
Labor		$13.06	$13.06	$5.88	$5.88
Materials	ink (white)	$8.11	$0.00	$3.65	$0.00
	ink (other colors)	$21.73	$56.26	$9.80	$3.50
	ink additives	$8.49	$5.76	$3.82	$2.59
Capital		$29.27	$29.27	$13.19	$13.19
Energy		$1.31	$1.31	$0.59	$0.59
Total		**$81.97**	**$105.67**	**$36.93**	**$25.75**

*Solvent-based ink #2; 45.5-inch press at 450 feet per minute

Table 5-B.9 Cost Summary for UV-cured Ink at Site 8*

Cost Category		Cost per 6,000 images for PE/EVA	Cost per 6,000 sq. feet for PE/EVA
Labor		$22.43	$10.10
Materials	ink (white)	$0.00	$0.00
	ink (other colors)	$12.10	$5.50
	ink additives	$0.00	$0.00
Capital		$50.28	$22.65
Energy		$4.37	$1.97
Total		**$89.18**	**$40.21**

*UV-cured ink #3; 25-inch press at 262 feet per minute

Table 5-B.10 Cost Summary for Water-based Ink at Site 9A*

Cost Category		Cost per 6,000 images for OPP	Cost per 6,000 sq. feet for OPP
Labor		$13.83	$6.22
Materials	ink (white)	$8.50	$3.82
	ink (other colors)	$6.81	$3.03
	ink additives	$0.71	$0.32
Capital		$29.80	$13.43
Energy		$0.92	$0.41
Total		**$60.57**	**$27.24**

*Water-based ink #4; 55-inch press at 425 feet per minute

Table 5-B.11 Cost Summary for Solvent-based Ink at Site 9B*

Cost Category		Cost per 6,000 images for OPP	Cost per 6,000 sq. feet for OPP
Labor		$14.16	$6.37
Materials	ink (white)	$14.84	$7.63
	ink (other colors)	$11.48	$5.55
	ink additives	$2.24	$1.02
Capital		$31.74	$14.30
Energy		$1.43	$0.64
Total		**$75.89**	**$35.52**

*Solvent-based ink #1; 45.5-inch press at 415 feet per minute

Table 5-B.12 Cost Summary for Solvent-based Ink at Site 10*

Cost Category		Cost per 6,000 images for OPP	Cost per 6,000 sq. feet for OPP
Labor		$9.80	$4.41
Materials	ink (white)	$7.15	$3.68
	ink (other colors)	$19.54	$9.39
	ink additives	$7.98	$3.60
Capital		$21.96	$9.89
Energy		$0.99	$0.44
Total		**$67.42**	**$31.41**

*Solvent-based ink #2; 61-inch press at 600 feet per minute

Table 5-B.13 Cost Summary for UV-cured Ink at Site 11*

Cost Category		Cost per 6,000 images for LDPE	Cost per 6,000 sq. feet for LDPE
Labor		$14.69	$6.61
Materials	ink (white)	$48.07	$21.61
	ink (other colors)	$24.80	$11.20
	ink additives	$0.00	$0.00
Capital		$32.93	$14.83
Energy		$2.86	$1.29
Total		**$123.36**	**$55.55**

*UV-cured ink #1; 61-inch press at 400 feet per minute

Table 5-B.14 Ink Costs for All Performance Demonstration Sites

	Site	White Ink			Colored Ink			Average total cost per 6,000 images	Average total cost per 6,000 ft² of image
		Price ($/lb)	Cost per 6,000 images	Cost per 6,000 ft² of image	Price ($/lb)	Cost per 6,000 images	Cost per 6,000 ft² of image		
Solvent-based ink									
LDPE	5	$1.40	$12.46	$5.63	$2.80	$37.88	$17.08	$50.34	$22.71
	7	$1.40	$8.11	$3.65	$2.80	$21.70	$9.77	$29.81	$13.42
PE/EVA	5	$1.40	$0.00	$0.00	$2.80	$37.94	$17.08	$37.94	$17.08
	7	$1.40	$0.00	$0.00	$2.80	$21.70	$9.77	$21.70	$9.77
OPP	9B	$1.40	$14.84	$6.68	$2.80	$11.48	$5.18	$26.32	$11.86
	10	$1.40	$7.15	$3.22	$2.80	$19.54	$8.79	$26.69	$12.01
Water-based ink									
LDPE	2	$1.60	$8.61	$3.87	$3.00	$16.77	$7.56	$25.38	$11.43
	3	$1.60	$12.27	$5.52	$3.00	$8.73	$3.93	$21.00	$9.45
PE/EVA	2	$1.60	$0.00	$0.00	$3.00	$16.77	$7.56	$16.77	$7.56
	3	$1.60	$0.00	$0.00	$3.00	$8.73	$3.93	$8.73	$3.93
OPP	1	$1.60	$11.49	$5.17	$3.00	$9.66	$4.35	$21.15	$9.52
	4	$1.60	$12.58	$5.66	$3.00	$15.72	$7.08	$28.30	$12.74
	9A	$1.60	$8.50	$3.82	$3.00	$6.78	$3.06	$15.28	$6.88
UV-cured ink									
LDPE	6	$8.50	$27.12	$12.18	$10.00	$25.60	$11.50	$52.72	$23.68
	11	$8.50	$48.07	$12.61	$10.00	$24.80	$11.20	$72.87	$32.81
PE/EVA	6	$8.50	$0.00	$0.00	$10.00	$25.60	$11.50	$25.60	$11.50
	8	$8.50	$0.00	$0.00	$10.00	$12.10	$5.50	$12.10	$5.50

Table 5-B.15 Ink Additive Costs for All Performance Demonstration Sites

	Site	Extender			Solvent			Other Additives			Average total cost per 6,000 images	Average total cost per 6,000 ft² of image
		Price ($/lb)	Average cost per 6,000 images	Average cost per 6,000 ft² of image	Price ($/lb)	Average cost per 6,000 images	Average cost per 6,000 ft² of image	Price ($/lb)	Average cost per 6,000 images	Average cost per 6,000 ft² of image		
Solvent-based ink												
LDPE	5	$2.00	$0.00	$0.00	$1.00	$2.73	$1.23	$0.45	$0.00	$0.00	$2.73	$1.23
	7	$2.00	$0.00	$0.00	$1.00	$8.49	$3.82	$0.45	$0.00	$0.00	$8.49	$3.82
PE/EVA	5	$2.00	$0.00	$0.00	$1.00	$1.79	$0.81	$0.45	$0.00	$0.00	$1.79	$0.81
	7	$2.00	$0.00	$0.00	$1.00	$5.76	$2.59	$0.45	$0.00	$0.00	$5.76	$2.59
OPP	9B	$2.00	$0.64	$0.30	$1.00	$1.60	$0.72	$0.45	$0.00	$0.00	$2.24	$1.02
	10	$2.00	$0.00	$0.00	$1.00	$7.28	$3.28	$0.45	$0.70	$0.32	$7.98	$3.60
Water-based ink												
LDPE	2	$2.00	$0.00	$0.00	$1.00	$0.14	$0.06	$0.45	$0.07	$0.04	$0.22	$0.10
	3	$2.00	$0.64	$0.28	$1.00	$0.38	$0.17	$0.45	$0.49	$0.22	$1.51	$0.67
PE/EVA	2	$2.00	$0.00	$0.00	$1.00	$0.06	$0.03	$0.45	$0.06	$0.02	$0.12	$0.05
	3	$2.00	$0.00	$0.00	$1.00	$0.07	$0.03	$0.45	$0.27	$0.13	$0.34	$0.16
OPP	1	$2.00	$0.24	$0.12	$1.00	$0.10	$0.05	$0.45	$0.10	$0.05	$0.44	$0.22
	4	$2.00	$0.56	$0.26	$1.00	$0.04	$0.02	$0.45	$0.00	$0.00	$0.60	$0.28
	9A	$2.00	$0.34	$0.16	$1.00	$0.36	$0.16	$0.45	$0.01	$0.00	$0.71	$0.32
UV-cured ink												
LDPE	6	$2.00	$0.00	$0.00	$1.00	$0.00	$0.00	$0.45	$0.00	$0.00	$0.00	$0.00
	11	$2.00	$0.00	$0.00	$1.00	$0.00	$0.00	[a]			$0.00	$0.00
PE/EVA	6	$2.00	$0.00	$0.00	$1.00	$0.00	$0.00	$0.45	$0.00	$0.00	$0.00	$0.00
	8	$2.00	$0.00	$0.00	$1.00	$0.00	$0.00	$0.45	$0.00	$0.00	$0.00	$0.00

[a] A price for the UV additive (monomer) was not determined, because ink manufacturers state that extra monomer is not typically added to UV ink at press side.

Table 5-B.16 Labor Costs for All Performance Demonstration Sites

Ink	Substrate	Formulation Number	Site	Press Speed (ft/min)	Cost per 6,000 images	Cost per 6,000 ft^2 of image
Solvent-based	LDPE	#S2	5	400	$14.69	$6.61
			7	450	$13.06	$5.88
	PE/EVA	#S2	5	400	$14.69	$6.61
			7	450[a]	$13.06	$5.88
	OPP	#S1	9B	415	$14.16	$6.37
		#S2	10	600	$9.80	$4.41
Water-based	LDPE	#W3	2	403	$14.59	$6.56
			3	218	$26.96	$12.13
	PE/EVA	#W3	2	403	$14.59	$6.56
			3	430	$13.67	$6.15
	OPP	#W1	4	450	$13.06	$5.88
		#W2	1	430	$13.67	$6.15
		#W4	9A	425	$13.83	$6.22
UV-cured	LDPE	#U1	11	400	$9.80	$4.41
		#U2	6	344	$17.09	$7.69
	PE/EVA	#U2	6	354	$16.60	$7.47
		#U3	8	262	$22.43	$10.10

[a]The PE/EVA run for Site 7 was aborted. For this analysis, the press speed was assumed to be the same as the LDPE run for Site 7.